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A SOCIETY FOR THE ADVANCEMENT
OF THE
SCIENCE OF ELECTROPLATING

SEPTEMBER, 1924

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NOTICE—UNEMPLOYED PLATERS

The Supreme Secretary has from time to time requests from manufacturers for names of competent platers who are out of work and often ask for prompt reply.

If a member, when out of work ,would advise the Supreme Secretary with full data pertaining to his qualifications, etc., this office will have on hand a list that can be selected from, according to class of position open.

At present there is a large band instrument company in the Middle West who wants an expert gold and silver plater who can handle production work and who knows his solution. Your branch Secretary has the name of this concern.

Yours very truly,

E. J. MUSICK,

Supreme Sec'y-Treas.

MONTHLY REVIEW

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PRESIDENT'S MESSAGE, SEPTEMBER

Membership Greetings:

I wish at this time to call your attention to the importance of your Research Committee and its relation to the Society, the Bureau of Standards and the things necessary to make it function to our interests; also a few remarks on the personnel of this Important Committee.

In view of the important work that many of the members of our society are doing in the different plants wherein they are employed, it seems that it would be possible to observe many things of vital importance to the advancement of the art of plating if the members would report them to the chairman of the Research Committee, who in turn could bring them up in the conferences held at fall and spring meetings at the Bureau for discussion and research.

The meet this fall at the Bureau of Standards will soon be announced by Dr. Blum, and every individual member of the American Electroplaters' Society is welcome to attend, and branches that are financially able are urged to send a representative, the larger the attendance we have the more weight our industry will have with the Bureau, as the interest displayed by us in the accomplishments of the Bureau along lines of research in plating is the best way he has of increasing the efforts of the Bureau along these lines. The many findings of the chemists at the Bureau, under direction of Dr. Blum, in past has been so material in advancement of this industry that the American Electroplaters' Society should have at least one member from each branch to attend the fall meeting. Remember, Dr. Blum called upon us in our home cities last fall and spring with his excellent lecture. Can we not return the visit?

The Research Committee consists of Mr. R. L. Shepperd of Detroit Branch, Chairman; S. E. Hedden, Pittsburgh Branch, and Past President Philip Uhl of Philadelphia Branch, none of whom need any introduction to you, as all have been contributors to our REVIEW in the past, and want you all to help them to make more history now.

Whatver you may see your way clear to do in assisting this committee with their work, without interference with your work or business, will be greatly appreciated not only by Dr. Blum, myself and the committee, but by every member of the American Electroplaters' Society; and as some writer has said:

The clock of life is wound but once,
And no man has the power
To tell just when the hands will stop—
At late or early hour.
Now is the only time you own;
Live, Love, toil with a will;
Place no faith in "Tomorrow," for
The clock may then be still.

F. J. HANLON,
Supreme President.

THROWING POWER OF NICKEL SOLUTIONS[1]

By H. E. Haring[2]

[1]Published by permission of the Director of the Bureau of Standards, Department of Commerce, Washington, D. C.

[2]Associate Chemist, Bureau of Standards.

1—Introduction

In the MONTHLY REVIEW for August, 1923, the principles of throwing power were explained and illustrated by results with copper sulphate and cyanide solutions. The same apparatus and methods were employed in a study of the throwing power of nickel solutions. The details of the measurements will be published shortly in the Transactions of the American Electrochemical Society. In this paper the results of interest to platers will be described and explained.

2—Principles

The principles involved will be summarized, but the

readers are advised to refer to the August 1923 Review for more detailed definitions.

The preceding work showed that the throwing power depends upon three factors, (a) the cathode polarization, (b) the resistivity (or conductivity) of the solution and (c) the cathode efficiency. As the cathode efficiency is the most important of these factors in the throwing power of nickel solutions, it will be considered in some detail.

The cathode efficiency may be defined as the percentage of the current used in depositing metal. The remainder of the current is usually consumed in discharging hydrogen, hence if the cathode efficiency is much below 100 per cent, there will be "gassing" at the cathode. The proportion in which metal and hydrogen will be deposited at the cathode depends principally upon (a) the intrinsic tendencies for their respective discharge and (b) the concentrations of metal ions and hydrogen ions in the solution (or more strictly speaking in the film of solution next to the cathode). These relations may be illustrated by means of copper and nickel solutions.

It is easier (requires a lower cathode potential) to deposit copper than to deposit hydrogen from a solution containing equivalent amounts of copper ions and of hydrogen ions, formed respectively from copper sulphate and sulphuric acid in an acid copper solution. Hence, it is possible to deposit copper with 100 per cent cathode efficiency at fairly high current densities even when considerable free acid is present. If however the current density is increased, after a certain point the cathode efficiency decreases, as is shown by the fact that hydrogen is also discharged and the copper deposit becomes "burnt".

On the other hand, it is easier to deposit hydrogen than nickel from solutions containing equivalent concentrations of these ions, hence, if a nickel solutions contains many hydrogen ions (much free acid) no nickel will deposit and the cathode efficiency will be zero at low current densities. If however the acidity is decreased, a higher potential will be required to discharge hydrogen, hence some nickel will also deposit. The proportion of nickel, i. e. the cathode efficiency, increases as the current density is increased unless very high current densities are used, in which case the

efficiency again decreases and the deposit becomes "burnt."

As the cathode efficiency is 100 per cent in the acid copper baths, it has little influence on the throwing power. In nickel plating, however, the cathode efficiency is lowest at the low current densities, such as exist at the least accessible parts of an object. Hence, the throwing power may be very low or even less than zero.

The throwing power was defined as "the deviation in per cent, of the metal distribution ratio from the primary current distribution ratio." If as in the throwing power box illustrated in Fig. 1, the primary ratio is 5 to 1, and the deposit on the (See illustration on next page)
near plate weighs four times as much as on the far plate, the ratio has improved (become more nearly uniform) and the throwing power is +20 per cent. If, however, as often happens in nickel solutions, the deposit on the near plate weighs six times as much as that on the far plate, the metal ratio is less uniform than that corresponding to the shape of the object represented by the box, and the throwing power is —20 per cent.

If as the results show, the throwing power in nickel solutions depends principally upon securing high cathode efficiency (especially at low current densities) it is obviously desirable to increase the ratio of nickel ions to hydrogen ions in the solution. This may be accomplished either by increasing the nickel concentration or by decreasing the the acidity (i. e. increasing the pH). Owing to "buffer" action some solutions do not change the degree of acidity or hydrogen ion concentration so readily when acid is removed or neutralized, as do others. If a solution were not at all buffered, e. g. a plain nickel sulphate solution, the acidity would decrease so rapidly when some hydrogen was discharged at the cathode, that the solution there would become relatively too alkaline, and basic nickel compounds would form and cause dark deposits. Boric acid is therefore used to regulate the acidity. If however, the solutions is too well buffered (e. g. the fluoride solution) the acidity of the cathode film remains too high and the efficiency and throwing power are reduced.

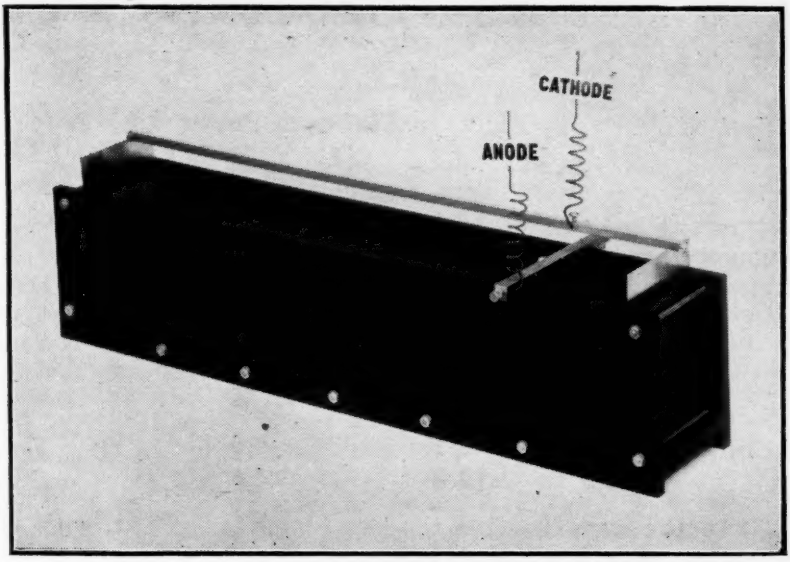

Fig. 1
The "Throwing Power Box"

3—Apparatus

The box shown in Fig. 1 was used as in the preceding experiments. To measure the throwing power with it, all that is necessary is to weigh the two brass plates before and after a total specified current is applied for a definite period. From the weights of the deposits on the two plates, the thowing power can be computed. The measurement of potentials and cathode efficiencies is necessary only when an explanation of the results is sought.

In this apparatus it is necessary to use a gauze anode. Commercial nickel gauze contains some manganese which may contaminate the solutions. Such gauze may be used however, by plating it heavily with nickel from the regular plating bath. Even then some of the nickel wire may become exposed and dissolved, hence the solution in the box should be changed frequently. In order to avoid any possible error from this source in our experiments a perforated platinum sheet was plated with nickel and used as the anode.

4—Results

The results obtained are summarized in Table 1

TABLE 1

Effect of		Throwing Power (%) at *				
		.05 amp.	.25 amp.	.50 amp.	1.00 amp.	1.50 amp.
Current Density		16.4	0.8	1.6	0.0	—0.8
Temperature 115°F		—9.4		2.4		
Agitation	Air	—104.2		—15.6		
	Mechanical (uniform)	—71.2		—20.0		
	Mechanical (local)	43.8		4.0		
Acidity	pH 4.5	12.4		0.6		
	pH 6.5	18.0		4.8		

*Total current used on the two plates in the box, with a combined area of 32 sq. in.

Results of Changes in Operating Conditions.
Solution Composition A ("Standard");—Nickel Sulphate 19 oz/gal, pH 5.7. Temperature 70°F.
Boric Acid 2 oz/gal, pH 5.7. Temperature 70°F.

which shows the effects of changes in the operating conditions of a so-called "standard" solution, and Table 2 which gives the effects of variations in the composition of the solution. The acidity of all solutions was pH 5.7 unless otherwise stated. A comparison of Fig. 2 and Fig. 3 shows the close relation between cathode efficiency and throwing power

5—Conclusions

The effects of the principal factors on the throwing power are as follows.

1. Current Density. An increase in current density causes the throwing power to approach zero, whether it is positive or negative at low current densities. At first it might therefore appear that at the usual average current densities all nickel solutions would have the same throwing

TABLE 2

Results of Changes in Solution Composition:

Effect of	Solution	Constituents in addition to boric acid 2 oz/gal	Concentration oz/gal.†	Resistivity ohm—cm 70°F	Throwing power (%) at‡ .05 amp.	.50 amp.
Nickel Concentration	B	Nickel sulphate	9.5	26	6.2	—0.2
		Ammonium chloride ...	1.8			
	A*	Nickel sulphate	19	21	16.4	1.6
		Ammonium chloride ..	1.8			
	C	Nickel sulphate	38	18	22.0	4.2
		Ammonium chloride ...	1.8			
Substitutions for Ammonium Chloride	D	Nickel sulphate	19	23	14.4	1.2
		Sodium chloride	2.0			
	E	Nickel sulphate	14	28	11.0	1.4
		Nickel chloride	4.0			
	F	Nickel sulphate	19	23	12.4	—1.2
		Magnesium chloride ..	3.3			
	G	Nickel sulphate	19	37	—6.0	—1.2
		("No chloride")				
	H	Nickel sulphate	19	24	—46.8	—11.2
		Ammonium sulphate ..	2.3			
	I	Nickel sulphate	19	27	—59.0	—9.0
		Sodium fluoride	1.5			
"All Chloride" Solutions	J	Nickel chloride	16	15	25.4	5.6
	K	Nickel chloride	16	12	31.6	10.0
		Ammonium chloride ...	1.8			
Additions	L	Standard+ sodium citrate	8.0	17	18.4	—0.8
	M	Standard+ dextrin	0.7	21	19.6	0.2
	N	Standard+ hydrogen peroxide	1.3§	21	—342.0	—53.8
	O	Standard+ sodium sulphite	0.13	21	4.8	9.0
Impurities	P	Standard+ cadmium chloride	0.015	21	6.0	—2.6
	Q	Standard+ copper sulphate	0.017	21	28.0	2.4
	R	Standard+ zinc sulphate	0.019	21	11.2	—1.0

*"Standard" solution.

†Concentrations are given for the crystallized salts.

‡Total current used on the two plates in the box, with a combined area of 32 sq. in.

§ Fl. oz.

power. Actually however, when recessed articles are plated, relatively low average current densities are used, or at least on the farthest parts the current density is low.

2. Temperature. Warming the solution decreases throwing power because it lowers the efficiency at low current densities.

3. **Agitation.** The chief advantage of agitation in plating is that it permits the use of higher current densities, i. e. of more rapid plating. If the solution were agitated equally over the entire surface of the article, the throwing

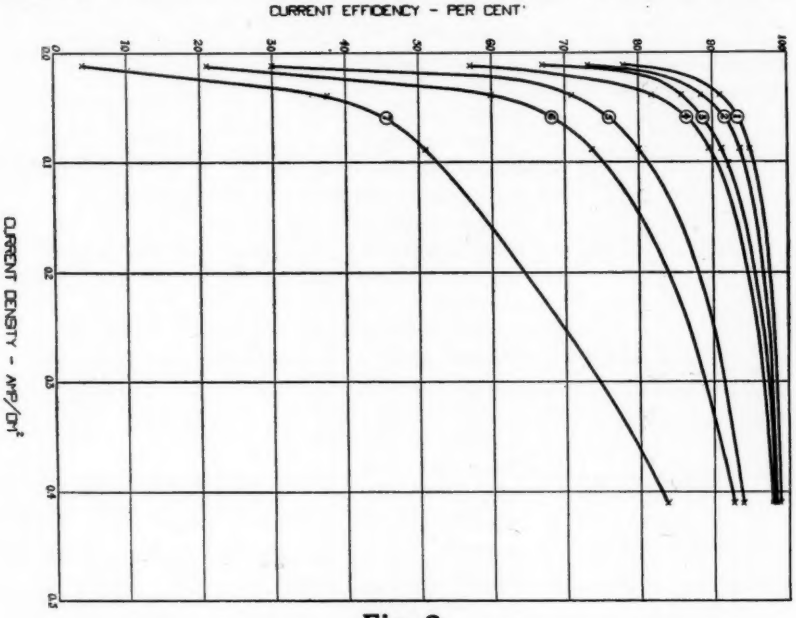

Fig. 2

Cathode Efficiency Curves in Nickel Deposition

To convert current density from amp/dm² to amp/sq. ft., multiply by 9. 3, or for practical purposes, by 10.

Curve

1—Solutions J and K ("all chloride")

2—Solution A at pH 6.5; C(2n-Ni) or E(0.25 n $NiCl_2$)

3—Solution A, D (NaCl); or F ($MgCl_2$)

4—Solution A at 45°C (113°F) or at pH 4.5; B(0.5 n-Ni); G ("no chloride"); L (citrate) or M (dextrin)

5—Solution H ($(NH_4)_2$ (SO_4) or I (NaF))

6—Solution A agitated

7—Solution N (H_2O_2)

power would be decreased. In practice however, the agitation, e. g. in a conveyor tank, is more marked on the exposed parts, on which the current density is highest. To represent these conditions ("local agitation") the solution close to the near plate was agitated, but not that at the far plate. The results show that such agitation improves the throwing power.

4. Acidity and Nickel Concentration. As previously indicated, the throwing power may be improved by increasing the nickel content or decreasing the acidity (increasing the pH).

5. Substitutions for Ammonium Chloride. All chlorides used improve the throwing power, while ammonium sulphate (which is present in the "double" nickel salt) and sodium fluoride each decrease the throwing power.

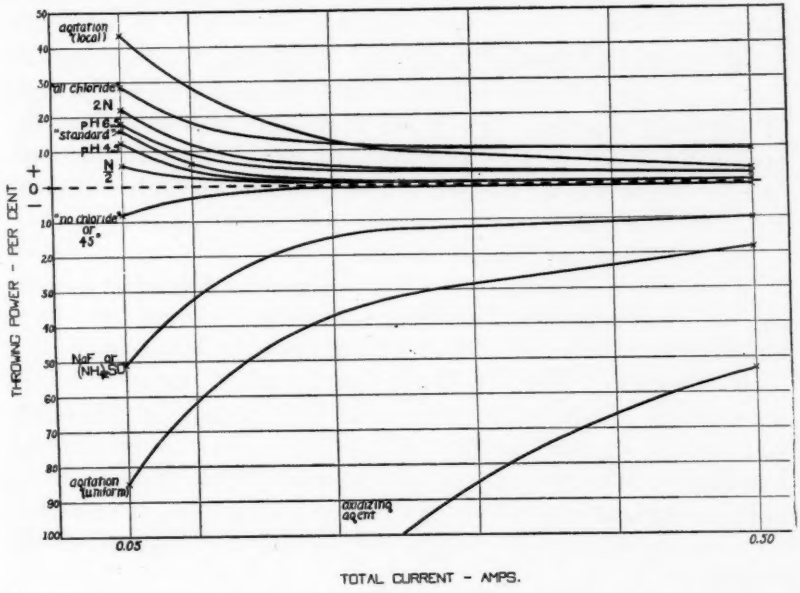

Fig. 3

Throwing Power in Nickel Deposition

The total current indicated was applied to two plates, each 10x10 cm (4x4 in.) in the throwing power box, with a primary ratio of 5.1.

The result with sodium fluoride confirmed the observation made a few years ago by G. B. Hogaboom, that the "fluoride" solutions have a poor throwing power. Since then a few experiments were made at the Bureau upon brass shaving soap boxes, about 1.2 inches in diameter and 2.2 inches deep. Some of these were plated in the "standard" solution, and some in the "fluoride" solution, for the same period and under the same conditions. The amount of nickel on the inside of the bottom and adjacent parts representing 20 per cent of the total area was then determined. The results showed that those plated in the solution containing ammonium chloride had 1.7 times as much nickel on the area examined as had those from the "flouride" solution. These results are consistent with those in Table 2 (+16.4 per cent and —59 per cent), and show clearly that the throwing power box does represent approximately the conditions upon an irregularly shaped article.

6. Nickel Chloride Solutions. Solutions containing all the nickel as chloride (such as were used in the early days of plating) possess very good throwing power. The deposits obtained by us were darker than normal, so that further work wil be needed before the use of such solutions could be justified.

7. Additions to Nickel Baths.

a—**Sodium Citrate.** This salt, often used in nickel plating on zinc, slightly improves throwing power, but not sufficiently to warrant its addition for this purpose.

b—**Dextrin.** Dextrin is a typical colloid, present as an impurity in commercial glucose and occasionally added in that form to nickel baths. While it slightly improves the throwing power, its use is hardly warranted, especially as nickel solutions are so susceptible to any excess of colloids, the concentrations of which are hard to determine or control.

c—**Hydrogen Peroxide.** This is an oxidizing agent, the use of which has recently been recommended by C. P. Madsen to prevent pitting. The very great decrease in throwing power is due to the fact that it requires a lower potential to reduce hydrogen peroxide than to deposit hydrogen or nickel, hence at low current densities the cathode efficiency is very low.

d—**Sodium Sulphite.** This compound was tried as a simple reducing agent. It improves throwing power at the higher current density, but produces dark and unsatisfactory deposits. It is included here simply because it suggests possible benefits in throwing power by the use of reducing agents.

8. Impurities. Previous work has shown that copper and zinc are the most detrimental metal impurities in nickel baths. Cadmium has often been used as a brightener, but its effects are so close to those of zinc that it may be included under this head. The effects of these metals upon the character of the deposits are more significant than those upon the throwing power.

In the amounts used, cadmium causes gray streaked deposits at low current densities, and bright deposits at higher current densities. In equivalent amounts zinc gives good, bright deposits at both high and low current densities. Copper even in very small amounts causes dark spongy deposits at low current densities, but has little effect at the higher current densities. In general the injurious effects of all such metallic impurities will be most pronounced at low current densities, or when the solutions are heated or agitated. For such conditions nickel salts of greater purity than those formerly specified by this Bureau may be desirable.

In conclusion the author wishes to express his appreciation for the helpful advice and suggestions received from Dr. William Blum, under whose direction this research was conducted and from George B. Hogaboom and the Research Committee of the American Electroplaters' Society.

AMENDMENTS ADOPTED AT MILWAUKEE CONVENTION

Relating to Honorary Membership:

Part 2, Article 2, Section 12:

HONORARY MEMBERS—This membership shall be conferred upon those whose knowledge and services will add to the welfare of the Branch. A Branch Society desirous of electing a person to Honorary Membership in their branch shall submit the name, with necessary informaton, to the Supreme Secretary. This must be approved by the

Supreme Executive Board before membership can be conferred. Branches must pay per capita tax on all Honorary Members, who are not Honorary Members of Supreme Society.

Relating to Object of Branch Societies

Part 2, Article 1, Section 2:

The object of each Branch Society shall be identical with the object of the Supreme Society as provided in paragraph 2 of the Preamble and are not permitted to affiliate with any other Societies in any way without permission of the Supreme Executive Board.

A COURSE OF INSTRUCTION GIVEN BY THE PHILADELPHIA BRANCH NO. 4

Willard M. Scott, Librarian

We were talking last meeting on atoms and molecule. Suppose we used sodium chloride in silver chloride to precipitate silver, the smallest amount of silver we would precipitate would be an atom. The smallest particle we could find in mining would be an atom.

In arranging a table of the elements we take the lightest at the top thus:

	Atoms
H	1
O	16
Cu.	63.6
Ag.	108

These numbers show how much heavier these atoms of elements are to hydrogen.

Now then, in speaking of molecules we know that the combining of atoms is a molecule, and the smallest molecule is H_2. In accordance with this distinction we may define the atom and the molecule as follows: An atom is the smallest particle of an element which can exist. A molecule is the smallest particle of a compound which can exist.

While the term atom therefore is applicable only to elements, the term molecule is applicable both to elements and compounds.

In our last instructions we studied the molecular weights and we found that by knowing the atomic weights of the constituent atoms, and how many atoms of each element

are present in the molecule, we merely summed up the results of the compound to find the molecular weights.

Hence, 2 grams of hydrogen will combine with 16 grams of oxygen to form 18 grams of water, this being the molecule weight.

H_2O—1x2 2
16
—
18 molecule wt.

Cu. 63.6Water

$Cu\ SO_4\ 5H_2O$

Cu.—	63.6
S—	32.
O_4—	64.
Water—	90.
×5	———
	249.6 molecule weight

Na Cu

Na	23
C	12
N	14
	———
	49 molecule weight

A solution is homogeneous to the eye and for our purpose may be regarded as a mixture of one or more pure substances in water. The liquid in which the substances dissolves is called the "solvent", while the dissolved substances is called the "solute".

By concentration we mean the amount of solute dissolved by a definite amount of solvent.

2/oz gal means 2 ounces per gallon, the actual weight of the substance in the solution, and to get any where in chemistry we must learn how to express ourself in the metric system, anything in ounces per gallon to convert it to grams we multiply the ounces by 7.5, the result being grams per liter.

2 oz per gallon
×7.5
———
15. grams per liter.

Single salts are more easily to dissolve than double salts.

There are two kinds of solutions we are going to refer to.

If we take H_2SO_4 which is the formula of one molecule of sulphuric acid it is expressed by 98

98 grams per liter is a molar solution

36.5 grams per liter of Hcl is a molar solution

40 grams per liter of NaOH is a molar solution

A normal solution contains one gram of combined hydrogen, or its equivalent in one liter. The molecular weight of hydrogen chloride, Hcl is 36.5 and of this 1 is the part due to hydrogen. Therefore, 36.5 grams of Hcl in a liter of solution constitutes normal hydrochloric acid.

This happens to be molar hydrochloric acid also, but molar and normal solutions are not always the same.

In sulphuric acid a molecular weight in grams, a molar or 98 per liter contains 2 grams of combined hydrogen and is therefore twice normal, 2 W. Normal sulphuric acid requires but 49 grams per liter of solution.

A normal solution of a salt contains one gram equivalent of the metal per liter of solution, 23 grams of sodium are equivalent to one gram of hydrogen, so a normal solution of sodium chloride contains 58.5 grams of the salt, Nacl per liter because 58.5 the molecular weight of sodium chloride is made up of 23 for sodium and 35.5 for chorine.

A normal solution is written N. A two normal solution 2 N, a half normal solution .5 N and so on.

Many compounds when dissolved in water undergo an important change. A portion of their molecular dissociate into two parts called ions. The cation or negative charges go to the cathode, while the positive anions is attracted to the positive anode:

$$Hcl = H^+ + cl-$$

$$Na\ OH = Na^+ + (OH)-$$

$$Kcl = K^+ + cl-$$

In reviewing the progress of our studies in chemistry, one realizes the dryness which usually accompanies the fundamental theory of any science.

It is obvious that the road to success in this science of electroplating is hard and dry, but the real route to scientific plating is only through the understanding of these principles.

Among the most important subjects we covered in these series of lectures was the normal solution with which it would be advisable to acquaint ourselves more thoroughly, although this lesson concludes the fundamental laws, and this theoretical way of expressing the subject, we by no means are through with them. In the next lesson, when we start with the manipulation of titration apparatus we will realize the necessity of the foundation which we have been laying, and will grasp with surprising rapidity these laws and rules which will prove essential in our analytical work.

COMMITTEE ON AWARDS FOR PAPERS

At the Milwaukee convention the undersigned committee was appointed to make awards of prizes for papers in accordance wth the plan outlined in the Review for March, 1924. We were directed by the Executive Committee to base such awards upon the most valuable idea or information contained in any paper by any active or associate member of the Society read at the Milwaukee convention, or at branch meetings, and published in the Monthly Review between June 1, 1924 and June 1, 1925.

Accordingly each paper published in the Review during the above period, will be independently read and rated by each member of the committee. After June 1, 1925, each member of the committee will submit to the Chairman a list in order of merit of the five papers which he considers best. These lists will then be transmitted to all of the committee members so that they may have an opportunity to consider them and again examine the papers if necessary before the time of the next convention. Sometime during the convention, the committee wll meet and make the final selections for the three prizes.

The committee on awards for papers will also meet with the committee on exhibits to select the winner of the Proctor medal.

September 11, 1924.

W. BLUM, Chairman
O. J. SIZELOVE
F. C. MESLE
S. E. HEDDEN
E. W. HEIL

FINISHING OF STATUARY BRONZE ON STEEL

By A. Rickson of Grand Rapids Branch

Our class of work is different than the usual run of hardware, so in that case it must be handled or treated diffrent in order for us to obtain our bronze (No. 1).

On steel the article or metal must be polished fairly good, we as a rule do not polish as good or finish as fine as we do nickel plated articles, but the finer it is polished the better the bronze finish appears. After polishing the article must be thoroughly cleaned, we use an electric cleaner. It is then hung in our nickel tank and given a fairly good nickel deposit. This is done so as to make sure that we have a protection against rust, as oxidizing on copper plated steel articles will start rusting very quickly, so the nickel deposit acts as a protection.

Then it is taken from our nickel tank and rinsed in clear water, and then placed into our hot copper solution and a one and one-half to two minute deposit of copper is given (No. 2), then back to our rinse tank or scrub tank. Our scrub tank is one with a partition down through the center lengthways, with holes bored in one end, so as to let water flow in one end and through the holes and pass out of the other end. This gives you one side of tank with clear water. Great care must be taken that there is not too much cyanide carried on or in plated articles into your rinse tanks, such as tubings and other articles that cannot be easily drained.

As the water becomes saturated with cyanide and this gives the plater much trouble in the way of loosening the oxidize on article.

From the rinse tank the article is submerged several times into an oxidizing solution (No. 3) until it turns to a deep brown or nearly black color. This solution is made up of about three-quarters of a pound of poly sulphide to ten gallons of water and about one pint of ammonia. Then it goes back to the scrub tank and the operator then takes a scrub brush and some O pumicestone and scrubs with the grain of metal or with polishing marks until he obtains the proper color (No. 4). This can also be done on or with a steel scratch brush, but it gives a different effect in color than our work requires (No. 5), so we find the only safe

way in our case of handling large articles, such as tubing, shaftings and large store grills and numerous other large pieces of hardware which we have to contend with, is to scrub by hand and in most cases it is much faster. Then the article is placed in a clean hot water tank, which is heated by live steam and wiped off with a clean rag. Most of the time the article will dry off without wiping. It is then placed on a steam coil which is covered with sheet metal so as to have a clean, smooth place to lay the work on and keep it dry. From there it goes to our spray lacquer booth and is given a clean, smooth spray of lacquer and then hung up or set aside to dry.

BRANCH NEWS

Dayton Branch

Our regular meeting of the Dayton Branch, A. E. S., was held Saturday, August 2, at the Y. M. C. A., with President Hohman in the chair. After the regular business was transacted, President Hohman handde in his resignation as president, which was accepted, as he has taken up other activities which might interfere with him holding office.

Our old friend, H. J. Harter, did a lot of barking, when nominated for president, which did him no good, for we finally won him over in high spirit. A report of the convention was made by our delegate, Walter Fraine, and stated that a good time was had by all. Walter promised us a paper in the near future.

Mr. Van Deran read a very interesting and instructive paper on production and improved method of plating and had a fine display of samples with him showing what can be done by the improved method. There were many questions asked and a general discussion followed.

Van is forging rapidly to the front, and was given a rising vote of thanks.

A committee was appointed for our annual picnic, which will be held the first Saturday in September.

St. Louis Branch

Regular meeting held on September 2 was very well attended. This being our first business session since the convention, several members spoke of the delightful and beneficial time they had in Milwaukee.

Our picnic committee reported a very successful outing at Belleville on August 16.

Librarian F. Horath will outline a program which will begin with October meeting and continue through several months.

Supreme Secretary Musick is right on the job as usual, boosting for Montreal, and urging our members to save their pennies.

Philadelphia Branch

Philadelphia Branch held its summer meeting and picnic at Willow Grove Park on Saturday, August 9. The meeting part of the program was dispensed with on account of the hot weather, so the picnic and amusements held full sway and was a great success, as the prizes for the ladies and the kiddies were the best to be had, and all the ladies and kiddies were highly pleased.

The committee in charge are to be congratulated for the fine assortment of prizes awarded and the grand showing made.

It is to be hoped that those members who did not attend this year will be able to attend next year and not miss the fun that we had this year. Our regular monthly meetings will be held on the first Friday of each month, commencing on Friday, September 5, 1924.

It will be best for all the members to start right in and make up their minds not to miss any of the meetings, thereby getting the full benefit of the lectures, which, I know, will be of interest to all the members.

In what better way could any plater spend two hours a month than by meeting his fellow artisans in a place of learning, such as we members of Philadelphia Branch have, and discuss various ways of taking care of our solutions and also developing new methods and finishes?

Now boys, lets get together and make this the best year Philadelphia Branch has ever had, and by doing so it will also be the best year for yourselves.

Cleveland Branch

The Cleveland Branch met at Hotel Winton September 6. Meeting was called to order at 8 p. m. by President Scott. There was a large attendance, which was very gratifying to the officers. After the regular order of business a general discussion was held and was very interesting to all. Adjournment was called for at 10:30 p. m.

Chicago Branch

Regular monthly meeting Chicago Branch, held September 13 1924, at Atlantic Hotel, 316 South Clark street, President F. J. Hanlon presiding and all officers present.

We had a very large attendnace and many questions in box. It seems as though the boys are getting down to work again since the cool weather has come on.

There will be plenty of work for the research committee this winter.

Boston Branch

Boston Branch met for the first time since last May on Friday, the 5th, at the American House, with President White in the chair.

While it was warm, we had about ten members present. After the regular order of business the members held a discussion on the working conditions of this town, which they say at the present time are very poor, but the outlook is very good, and expect things to pick up this month.

Waterbury Branch

Waterbury Branch, A. E. S., held a largely attended meeting Friday evening, September 12. Communications were received from the supreme officers and plans laid for complying with the suggestions contained therein. A vote was passed instructing the treasurer to pay the per capita tax when same was due, instead of waiting for a meeting to vote on same. An interesting talk was given by William Delage on the present and past work of the research committee, in connection with their work with the Bureau of Standards. One of the features of the evening was the discussion that took place relative to the worth of some of the black, rust-resistant finishes now on the market. The cause of yellowish spots appearing on the face of clock dials that had been silver plated and lacquered was also talked on. Other subjects that came up for discussion were the spotting out of brass-plated wire goods and the plating of cast buckles.

Librarian Messick, in conjunction with President Gray, has arranged for a series of talks on subjects that are of interest and instructive to the plater in his every day work.

Povidence-Attleboro Branch

The Providence-Attleboro Branch, A. E. S., started the fall season on Thursday evening, September 6, at their rooms at 184 Washington street, Providence.

The new officers outlined the work that should be accomplished before next summer. The educational lectures and social events were talked over. Delinquent members came in for a little discussion, and it was decided that the best policy to follow was to compel the members in arrears to either pay up or shut up, so before many weeks we should know how many are with us and how many have fallen by the wayside.

The discussion for the evening was the most popular finish in the jewelry industry at the present time. The topic that has caused much worry and the cause of many formulas for coming to the surface, "White Gold."

Eighteen karat white gold deposit has proven the best so far. Platinum and palladium are metals that are being used very extensively at the present time. Platinum plate is a very pretty finish, bright, clean and rich looking. Palladium has the advantage over platinum, as it can be plated from a cyanide solution very easy. It is possible to alloy palladium and gold in solution and get an excellent white, but the cost is much more than white gold but much cheaper than platinum plate.

So far it has been impossible to alloy platinum with any metal and plate from a solution.

The discussion lasted until late at our rooms and will be taken up at our next meeting to be held at Attleboro.

Detroit Branch

Due to absence of Secretary R. L. Shepard, September 5, reading of minutes, communications and routine business was dispensed with, and entire time taken up with a "Paper on Chronium Plating by Steel," by aMr. George Dubpernell of Redford, Mich.

The subject was very ably handled by aforementioned gentleman, who covered the entire field, historical, experimental and the best solutions used at present time were fuliy stated, with all the conclusions reached thus far by the writer.

The paper was rendered all the more enjoyable by the fact that as each point was brought out it was thoroughly discussed before proceeding with the paper. The paper will, no doubt, be published in MONTHLY REVIEW and other A. E. S. members enabled to enjoy the privilege accorded the large number of Detroit members present.

Mr. Dubnrell was accorded a rising vote of thanks.

Meeting adjourned at 10:45 p. m.

Chicago Question Box

Question No. 1—What is a good lubricant for ball burnishing die cast?

Answer No. 1—A solution of whale oil soap 20 lbs., carbonate of soda 2 lbs, cyanide 5 lbs., water 50 gals.

Question No. 2—What makes dies castings that are polished and plated in brass and nickel after they are out for a week blister and peel?

Answer No. 2—Plate castings in brass solution that is high in metal and low in cyanide was recommended.

Question No. 3—What is a good formula for a brass solution to plate steel chain either still or mechanically?

Answer No. 3—A still solution of copper 3½ oz., zinc 1½ oz., with a small addition of ammonia.

Question No. 4—What is a good formula or a method to remove oil from a nickel solution that has nufregnated from plating greasy casting?

Answer No. 4—Heat solution and skim with tissue paper.

Bridgeport Branch

The regular meeting of the Bridgeport Branch was held September 4, with an attendance of 22. President William Flaherty presided.

A speakers' committee, consisting of John Oberender, George Karl and Ray O'Connor, was appointed. We look forward to having some very interesting speakers at our open meetings. A motion was made and seconded to have our first open meeting, September 26, an "Old-Timers'" night. The members were asked to bring refreshments and to also bring their superintendent, manager and any of their friends.r

A letter was read from Mr. John Dunn, one of our past presidents, who is at the present time on the board of managers. Mr. Dunn asked that we accept his esignation from the board, expressing regret thatr due to ill health he was unable to attend our meetings or take an active part in our work.

We all regret that Mr. Dunn cannot take the active part at the present that he has always in the past. We think, however, that after he has rested up he will be back strong and help carry out the aims of the society.

Mr. John Slattery was appointed to fill Mr. Dunn's office on the board of managers.

Mr. John Oberender was asked to give his impressions of the Milwaukee convention and he very ably covered every point of the meeting in a very interesting manner.

ELECTED TO MEMBERSHIP

Philadelphia Branch

Peter Relenski .....3324 E. Almond St., Philadelphia, Pa.
Albert Hirsch .....1537 N. 13th St., Philadelphia, Pa.
J. M. Burd .....5255 Relker St., Harrisburg, Pa.
Claude Bessler .....2840 Taney St., Philadelphia, Pa.

Newark Branch

Roland Rabourdin .....282 Summit Ave., West Hoboken, N. J.

Chicago Branch

Walter Lockerbie .....4433 Greenview Ave., Chicago, Ill.

APPLICATIONS

Cleveland Branch

Paul Stamm .....947 Ebon Road, Cleveland Hts., Ohio

Chicago Branch

Cleveland F. Nixon, Associate .....Western Clock Co., La Salle, Ill.
Frank Joseph Hodapp, Active.....1112 2nd Ave., Rock Island, Ill.
John Groclococki, Active .....4909 Wellington Ave., Chicago, Ill.

St. Louis Branch

Geo. H. Dulgarian.....1431 So. Los Angeles St., Los Angeles, Cal.

Philadelphia Branch

Horace C. Maul, Active .....425 McCosh St., Hanover, Pa.
K. H. Bauer, Active .....5414 Woodland Ave., Philadelphia, Pa.
James MacCrendle, Associate .....Walnut Park, Pa.
John Mahaffey, Active .....1743 Tilghman St., Philadelphia, Pa.

RESIGNED

Boston Branch

John H. Wall .....170 W. Brookline, Boston, Mass.

DEATHS

Wm. Kemp, 1937 Hancock St., Chicago, Ill., died Sept. 11, 1924.

Fred J. Higgins of Providence-Attleboro Branch, died very suddenly July 3, 1924.

BOSTON

Regular meetings are held first Friday of each month, at 8 p. m., at the American House, Boston. Secretary, A. W. Garrett, 89 Alexander St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at 62 Cannon St., Room 17, Bridgeport, Conn. Secretary R. J. O'Connor, 1128 Noble Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 316 S. Clark St. Secretary, Robt. Meyers, 1116 Lill Ave., Chicago, Ill.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty St. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets last Saturday of each month at Hotel Winton. Secretary, H. S. Kneeland, 3924 Clybourne Ave., Cleveland, Ohio.

HARTFORD-CONN. VALLEY

Meets on the fourth Monday of each month at 747 Main St., Hartford, Conn. Secretary, Jas. A. Bagshaw, 39 Grand St., New Britain, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Albert Bates, Box 34, Vandalia, Ohio.

DETROIT

Meets first Friday of each month at 478 Alexandrine West. Secretary, E. W. Woodmansee, 91 Medbury Ave, Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., N. E. Secretary, John Raven, 1139 Emerald Ave., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at Lipps Hall, 321 3d St. Secretary, R. Steuernagel, 1508 Concordia Ave.. Milwaukee, Wis.

MONTREAL

Meets every Friday at 84 Craig St. West. Secretary, John H. Feelay, 411 Aylmer St., Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at No. 17 Central Ave., Newark, N. J. at 8 p. m. Secretary, John Hiem, 25 Chestnut St., Newark, N. J.

NEW YORK

Meets second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York City. Secretary, John E. Sterling, 468 Grand Ave., Long Island City, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 184 Washington St., Room 308, Providence, R. I. Secretary, Robert Crook, 185 County St., Attleboro, Mass.

READING

Meets on the second Tuesday of each month. Secretary, William M. Fisher, 654 Gordon St., Reading Pa.

ROCHESTER

Meets every second and fourth Saturday of each month at the Powers Hotel. C. A. Reama, Secretary, 512 Lyell Ave., Rochester, N. Y.

ST. LOUIS

Meets first Tuesday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, H. H. Williams, 4156 Botanical Ave., St. Louis, Mo.

TOLEDA

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, W. W. Weiker, 411 3d St., Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Walter L. Barrows, 628 Dover Court Road, Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. F. Guilford, 230 Cooks St., Waterbury, Conn.